MCA (Revised)

Term-End Examination

December, 2009

15316

MCS-033 : ADVANCED DISCRETE MATHEMATICS

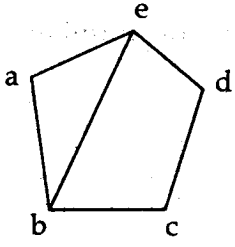
Time : 2 hours *Maximum Marks : 50*

Note : *Question **no. 1** is **compulsory**. Attempt **any three** questions from the rest.*

1. (a) Determine the number of subsets of a set of n elements, $n \geq 0$. **4**

(b) The number of vertices of odd degree in a graph is always even. **3**

(c) What is the complement of the given graph **2**



(d) Solve the recurrence relation **4**

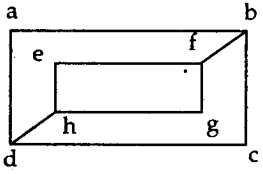
$a_n - 2a_{n-1} - 3a_{n-2} = 0$, $n \geq 2$ with

$a_0 = 3$ and $a_1 = 1$

(e) Show that a complete graph kn is planar if $n \leq 4$. 4

(f) Let $f(n) = 5\, f(n/2) + 3$ and $f(1) = 7$. Find $f(2^k)$ where k is a positive integer. Also estimate f(n) if f is an increasing function. 3

2. (a) Determine whether the graphs are isomorphic. 4



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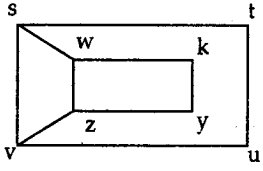

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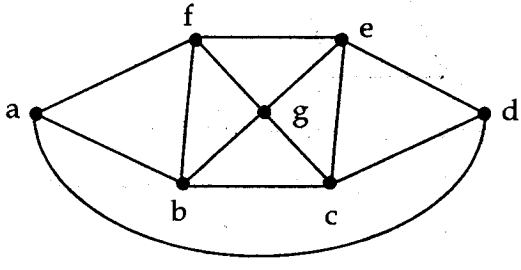
(b) Solve the recurrence relation 4

$$S_r - 4Sr_{r-1} + 4S_{r-2} = (1+r)2^r$$

(c) What is the chromatic number of the following graph. 2

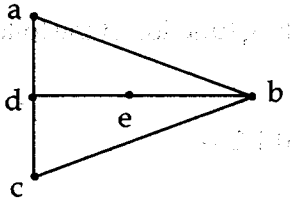


3. (a) Find the order and degree of the following recurrence relations. Also find whether they are homogeneous or non homogeneous ? 4

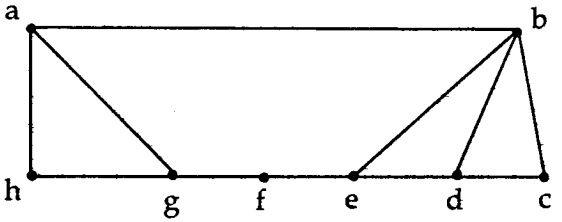
(i) $a_n = 3a_{n-1} + n^2$

(ii) $S_n = S^2_{n-1} + S_{n-2}\, S_{n-3}\, S_{n-4}$

(b) Show that the graph given below does not contain a Hamiltonian cycle. 3



(c) Whether the following graph contains Euler circuit a : 3



4. (a) Solve the following recurrence relation using generating function. 5

$a_n - 9a_{n-1} + 20a_{n-2} = 0$ for $n \geq 2$,

$a_0 = -3$ and $a_1 = -10$

(b) What is the largest number of vertices in a graph with 35 edges if all vertices are of degree at least 3 ? 5

5. (a) Suppose a tree has n_1 vertices of degree 1, 2 vertices of degree, 2, 4 vertices of degree 3 and 3 vertices of degree 4, find n_1. 3

(b) Find the solution of 5

$$\sqrt{a_n} - 5\sqrt{a_{n-1}} + 6\sqrt{a_{n-2}} = 0,\ n \geq 2$$

where $a_0 = 4$ and $a_1 = 25$

(c) Find the generating function of the following function. 2

$a_r = 2r + 3,\ r = 0,1,2\text{---}$

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